Materials Tip

Materials Engineering Branch

Antistatic Sprays			
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Seventeen antistatic sprays were examined by the Materials Engineering Branch to determine their acceptability for aerospace applications. These sprays consisted of organic materials such as alkanolamines, alcohol/glycol derivatives and aliphatic esters. Some of these sprays contained ammonium chloride compounds.

The sprays were characterized for the following properties:

1. Contamination potential
2. Moisture absorbance
3. Corrosiveness
4. Effectiveness at reducing charge accumulation

Contamination Potential

The amount of non-volatile residue (NVR) and the amount of outgassing materials contained in the sprays were measured. NVR is residue with low volatility at room temperatures. NVR has been shown to be transferable by contact transfer and by vaporization - condensation mechanisms. The greater the amount of NVR, the more likely that it may be transferred to surfaces that come into contact with the NVR.

% NVR Content:

The results indicated that the NVR content of the sprays ranged from <0.5% to as high as 8%.

% Outgassing Materials in NVR:

The amount of outgassing materials contained in the sprays ranged from 1-15% of the total amount of NVR collected.

Moisture Absorbance

The following are the results of the moisture absorbance test conducted on the NVR collected from the antistatic sprays. These results give an indication of the amount of water which was absorbed once the antistatic spray had dried on a surface at room temperature and 65% relative humidity.

The results indicate that the amount of moisture absorbed by the NVR ranged from <1% to 45%.

Corrosiveness

The ability of the sprays to corrode a mirrored surface was examined. Each spray was rated as either being slightly corrosive, moderately corrosive or severely corrosive. The test results indicate that sprays that contain tertiary amines are likely to be more corrosive. This is because of the strong basic properties of tertiary amines. Sprays that contain ammonium chloride and primary amines were found to be moderately corrosive. The sprays that contained alcohol/glycol derivatives showed little or no corrosive effects.

Preventing Charge Accumulation

Each spray was tested for its ability to prevent a charge from accumulating on a surface in environments with relative humidities ranging from 20-60%. A low peak voltage in this test indicated that the spray was effective in preventing the accumulation of a charge on a surface.

60%-20% RH:
Peak voltages for these sprays ranged from 20-6500 volts.

The ability of the sprays to quickly dissipate a charge was also measured. The results showed that no single spray demonstrated the ability to prevent charge accumulation on a surface while also quickly dissipating any charges which did happen to accumulate.

Summary

An ideal antistatic spray would prevent a high charge accumulation on the applied surface and also quickly dissipate any charge which would have accumulated. It would have: a low NVR content, a low percentage of outgassing components; the NVR in sprays would absorb little to no water from the environment and would not corrode the metal surfaces to which the sprays were applied.

The results from this study indicate that none of the seventeen antistatic sprays tested meet all the "ideal" requirements; therefore, none of them are recommended for use in clean room applications. Because the NVR content (and therefore the potential outgassing materials) is variable depending on which antistatic spray is being tested, any potential spray should be tested thoroughly prior to use in a clean room or other critical environment. In other non-critical situations, some of the antistatic sprays would be suitable for use. Each application must be examined individually in order to determine any adverse effects the antistatic sprays may have.

More information and detailed data on the seventeen sprays tested can be found in NASA Technical Memorandum 1007040. For more information concerning the testing of other antistatic sprays, please contact the Materials Engineering Branch, Code 541.